

## GENERAL SCIENCE GROUPS

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### Requirements For the Degree of Bachelor of Science.

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The college does not prescribe in detail a full course for the bachelor's degree, but leaves to the individual student not only the choice of the general line of his work, but a considerable freedom in the selection of his work in detail. But in order to afford the student guidance in the choice of his elective work, a group system has been established, and at the end of the freshman year the student elects to follow some one of these groups.

For convenience in estimating the requirements for a degree, the following rules are laid down:

One hour a week for a semester of recitation or lecture work, or two and one half hours a week for a semester of laboratory or library work or drawing, shall count as one credit.

Candidates for the bachelor's degree must complete satisfactorily not less than 130 credits, including the prescribed work in military drill, or domestic science; and including also a thesis, the value of which in credits shall be determined by the instructor concerned. No regular student may take in any one semester work amounting to more than nineteen credits or less than twelve.

Students who are relieved for any reason of the requirements in military drill or domestic science, shall present four additional credits in some other subject; but the president may, at his discretion, excuse from such requirements any student in the employ of the institution.

Students who complete the work prescribed on the following page for all candidates for a degree, together with the work laid down in any one of the groups, will be recommended for the degree of Bachelor of Science.

All students, one-half of whose work shall have received the grade of A or B, will be recommended for the degree "cum laude."

All students, one half of whose work shall have received the grade of A, will be recommended for the degree "magna cum laude."

Several subjects taught in departments not represented in these groups are open to election by general science students on consent of their advisers. Among these may be mentioned Agriculture (described in the agricultural course), Shop Work (described in the engineering course), Book-keeping and Stenography (described in the statement of the business department), Surveying (described in the civil engineering course). The credits to be allowed for these subjects will be decided upon agreement of the instructors concerned.

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## PRESCRIBED FOR ALL CANDIDATES.

Among the 130 credits required for the degree of bachelor of science, the preliminary list subjoined shows the work prescribed for all candidates for the degree.

### Preliminary List.\*

**Freshman Year.**—Mathematics (1, 2 and 3), 8; Chemistry (1-2), 8; English (1), 4; Public Speaking, 2; Foreign Language, 8;† Art (1, 2, 3, 4 or 5), 2; Military Drill (for men), 2; Domestic Science (for women), 2.

**Sophomore Year.**—Foreign Language, 6; English, (10)‡ or History (1 or 2), 4; Physics (1 and 2), 10, or Botany (2), and Zoology (1a), 10;\*\* Military Drill (for men), 2; Domestic Science (for women), 2.

**Junior and Senior Years.**—English (10)‡ or History (1 or 2), 4; Physics (1a) 6, or Botany (2) and Zoology (1b), 6;\*\* Ethics, 3; Psychology, 3; Economics, 4.

For the remainder of his work the student must choose one of the nine groups following, and be guided by its prescriptions and limitations in the direction of his work. Some freedom of choice in a part of the work is ordinarily allowed, but the student will be under the guidance of the instructor presiding over his group. It is to be noted that no subject may at any time be chosen that conflicts with prescribed work.

The following groups are offered: Botany, Chemistry, Domestic Science, English, History, Mathematics, Modern Languages, Physics, Zoology.

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## THE GROUPS

### Botany

It is the purpose of the Botanical group not only to afford a liberal education in science, literature and philosophy, but also to give the student special training in botany and zoology, so that graduates from this department may be fitted for positions as teachers and advanced workers in these subjects, and also be prepared to take advanced standing or graduate work in the Eastern universities. The large number of electives offered will en-

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\*In the following outlines, figures in parenthesis, are numbers of the sub-courses. Other Arabic numerals denote the number of credits allowed for each sub-course. The Roman numerals I and II are used to designate the two semesters of the year. Hence, Botany (1), 4, I, means Botany, sub-course 1, a four-credit course, given in the first semester. Chemistry (1, 2), 8, I and II, means Chemistry, sub-courses 1 and 2, counting together 8 credits, and running throughout the year. An account of the sub-courses may be found following the groups. The subjects are there arranged in alphabetical order, except the subjects taught by the president.

\*\*If Physics is taken in the sophomore year, Botany and Zoology must be taken in the junior year, and vice versa.

†Latin, French or German.

‡Both these subjects are required of all candidates for a degree. At least one must be taken in the sophomore year; the other may be taken in the junior or senior year.

able the student to adapt his work to his special needs and yet remain proficient in some one subject so as to best meet the practical demands of modern life. Students intending to take this group should devote special attention to Latin, French, German, and Art.

**Sophomore Year**—Botany (2) and Zoology (1a), 10; **Elective**, 8.

**Junior Year**—Botany (3 or 4), 4; Modern Languages, 6; **Elective**, 12.

**Senior Year**—Botany (4 or 5), 4; Thesis in Botany, **Elective**, 6.

### Chemistry

The purpose of the course in chemistry is to make educated chemists, men who are not only qualified to make correct analyses of what may be handed them, but who have also had, with their technical training, a good, liberal education. The possibilities of the successful application of chemical knowledge to the solution of the problems of daily life on the farm, in the smelter, the dye works, the sugar refinery the gas works, and in nearly all manufactures and the arts are too well appreciated to need any argument.

A reading knowledge of French and German is required for graduation from this group.

**Sophomore Year.**—Quantitative Analysis (6), 5; Inorganic Preparations (8), 4; Organic Chemistry (10 and 11), 6. (In this group, the sophomore science requirement from the preliminary list will be biology.)

**Junior Year.**—Physical Chemistry (4 and 5), Crystallography, 1; Mineralogy, 2; Quantitative Analysis (7 and 12), 8; Seminar, 2. (In this group the junior science requirement from the preliminary list will be physics.)

**Senior Year.**—Agricultural and Sanitary Chemistry (9), 4; Quantitative Analysis (13), 3; Toxicology (4), 2; Geology, 5; Seminar, 2; Thesis, 9.

### Domestic Science

It is the purpose of the Domestic Science group to give women a liberal education with a scientific basis. It is also designed to provide an opportunity for the correlation of chemistry and biology with household work.

Normal training, both in sewing and cooking, is given to those students who are preparing to become domestic science teachers. The work of the department aims to be scientific, artistic and practical.

**Sophomore Year**—Domestic Science (2 and 3), 4; Sewing (8) II, 2; Art (1, 2, 3, 4, or 5), 1, 2; **Elective**, 4.

**Junior Year**—Domestic Science (4 and 5), 4; Sewing (9), 2; Chemistry (3), 8; **Elective**, 7.

**Senior Year**—Domestic Science (6), 4; English (11), 4. Six credits in allied subjects to be assigned on consultation with the instructor. Sewing, 4. **Elective** and Thesis, 8.

### **Mathematics**

This group is so arranged as to afford a broad foundation in science, language and philosophy, with a somewhat more special training in Mathematics. It is purposed to prepare for teaching and at the same time lay the foundation for the work of the graduate school. Students expecting later to take engineering may so arrange their work in this group that they may complete their engineering course in two years after graduation.

A reading knowledge of German and French is required for graduation from this group, and it is desirable that it should be acquired during the first two years of the course, as these languages will be very useful for the work of the later years.

**Sophomore Year**—Mathematics (3 and 4), 10; Physics (1 and 2)\*, 10. **Elective**, 0 to 8.

**Junior and Senior Years**—Mathematics, 15, to be chosen from subcourses (10 to 16:) Astronomy, 2. Thesis, 6. Twelve credits in allied subjects to be assigned on consultation with the instructor. **Elective**, 23 to 33.

### **Modern Languages, History and English**

These three groups are common in their requirements. The work outlined below is planned for those students who, though wishing a broad foundation in science, do not desire to specialize in any one science. It includes a variety of work in addition to that prescribed in the Preliminary List, and especially makes considerable additions to the requirements in foreign languages. While these groups do not in any way anticipate the work of a graduate school, the student may so choose his electives as to be adequately prepared at the end of his college course for graduate work in any one of these three subjects.

**Sophomore Year**—Foreign Language, 6 or 8\*\*; **Elective**, 2 to 4. (The History and English, which may be taken in different years, as given in the Preliminary List, are both to be taken in the sophomore year in this group.)

**Junior Year**—Foreign Language, 6; English (11), 4, or, History (2), 4; United States Constitution, 2. **Elective**, 12 to 14.

**Senior Year**—Sociology, 3. **Elective**, and Thesis, 17 to 20.

### **Physics**

In this group Physics is taken during three years of the course as a part of a liberal education, with the idea of laying a foundation for more advanced work and for the purpose of providing a preparation for teaching. Electives are offered in Mathematics and Chemistry such that advanced training in either one may be obtained or some of both may be taken.

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\* See Preliminary List.

\*\* In addition to that already prescribed in the Preliminary List.

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**Sophomore Year**—Physics (1 and 2)\*, 10; Mathematics (3 and 4), 10.

**Junior Year**—Physics (3 and 4), 4; Physics (5), 4; Zoology (1b), 3; Botany (2), 3. **Elective**, 10.

**Senior Year**—Physics (6), 6. Thesis and **Elective**, 21.

#### **Zoology**

It is the purpose of the Zoological group to afford opportunity for a liberal training in science, literature and philosophy and at the same time to devote more time to Zoology than is given in the other groups.

**Sophomore Year**—Zoology (1a), 5; Botany (2), 5\*. **Elective**, 12.

**Junior Year**—Zoology (2), 4; Modern Languages, 6. **Elective**, 9.

**Senior Year**—Zoology (3), 4; Economic Entomology (4), 6. **Elective**, 17.

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## **PHILOSOPHY AND SOCIOLOGY**

PRESIDENT HAMILTON.

(1.) **Psychology**—This course presents a general view of modern psychology and is required of all general science students. It gives a practical exposition of the materials and methods of psychological investigation. The lectures are accompanied by class demonstrations. Attention is given to such topics as the growth of the central nervous system, the nature of consciousness, sensory and motory training, the higher intellectual faculties and the will. So far as possible the work is made practical and concrete. I, 3.

(2.) **Ethics**—The work in ethics includes a study of the evolution of conduct, moral standards, the social and industrial life, the development and trend of ethical thought and an examination of utilitarianism. Required of general science students. II, 3.

(3.) **History of Philosophy**—An examination of the most important schools of philosophy from the Greeks to the present time. Especial attention is given to such central figures in philosophical thought as Plato and Aristotle, Descartes, Spinoza, Kant and Hegel; the study of Epicureanism and Stoicism, scholasticism, idealism and realism. **Elective**, I, 2.

(4.) **Logic**—This work is valuable as a training of the faculties for the discovery of truth and the detection of error. The course includes a thorough study of the textbook and a practical application of the principles of logic to the student's habits of thinking and expression. All theoretical work is followed by practical exercises. **Elective**, II, 2.

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\* See Preliminary List.

(5.) **Economics**—This course consists of a study of such questions as land, capital, labor, money, coinage, banking, rent, interest, wages and taxation. The most important question in economics of the present time are considered. Among these may be mentioned trusts, labor organizations, government ownership of public utilities, co-operation, recent currency legislation and the single tax. Required of general science students. I and II, 4.

(6.) **Sociology**—The origin and history of human society, the various social theories and the laws of human intercourse are treated. Attention is given to such practical subjects as the government of cities, settlement work, the enrichment of country life, and charity work. Elective, I, 3.

(7.) **International Law**—Woolsey's textbook is used, but is supplemented by lectures and library work. In addition to the study of the principles of international law, an examination is made of treaties and the findings of international congresses. A practical study is made of the important questions in which our own government is especially interested, such as the Monroe Doctrine, the Eastern question, international arbitration, etc. Elective, II, 3.

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## ART

MRS. MARSHALL.

(1.) **Drawing from Nature**—Drawing and painting of plants and animals, intended especially for students in biology. It may be taken in either semester separately. I and II, 2-6.

(2.) **Architectural Drawing**—Studies in perspective and architectural forms, intended especially for students in engineering and allied pursuits. It may be taken in either semester separately. I and II, 2-6.

(3.) **Normal Work**—This is a course in the training of the eye and hand and in the methods of teaching, intended especially for those who may be planning to teach Art. Those who take this work will be allowed some opportunity for practice in teaching. I or II, 4-8.

(4.) **Applied Design**—Studies in color harmony, and historic ornament, leading up to practical designing for the various handicrafts,—embroidery, decoration, wood carving, joinery. I and II, 2-8.

(5.) **Clay-Modeling and Wood-Carving**—Study in light and shade and their application to designing in the handicrafts. I and II, 2-8.

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**BOTANY**

DR. BLANKINSHIP,

MR. JONES.

(2.) **Morphology of Cryptogams**—This course will embrace a study of the principal forms of lower plant life from the morphological standpoint, during which the student will learn the use of the compound microscope and its accessories, as well as the usual methods of staining and mounting microscopical preparations for permanent preservation; while accuracy of observation and expression will be attained by the notes and drawings made in connection with these studies. II, 4.

(3.) **Histology and Physiology of Plants**—A study of the cell, tissues and nascent organs of plants, continuing the work of the subject above; also a study of the functions of the living plant, the phenomena of assimilation, growth, movement, transpiration, reproduction, etc. Required in the Botanical group. II, 4.

(4.) **Advanced Systematic Botany**, continuing the work of (1) or (2) from the systematic standpoint. This will embrace a more extended study of the local flora, the collection and preparation of herbaria, accurate description of species and the use of the card-index in scientific work. The work will be largely individual and may be confined either to the Phanerogams or Cryptogams. The department library is unusually strong in the more important works of the various branches of systematic botany, and other more special publications will be purchased as needed. This study may alternate with (3) or be substituted for it, at the option of the student electing this group. I and II, 8.

(5.) **Bacteriology**—An elementary study of the life-history of bacteria, their growth in nutrient media and methods of analysis and classification, as well as their economic import in agriculture, medicine and our daily life. The department now has all apparatus and reagents necessary for this work, including three high-power microscopes with oil immersion objectives and Filar micrometer, and facilities will be provided for such students as care to continue the study. II, 4.

(6.) **Economic Botany**—A course of sixteen lectures on weeds, forage plants, forest and shade trees, plant diseases, plants poisonous to stock, the plants used for food, shelter, fibers, and in medicine; and the relation of bacteria to agriculture. This is intended for the short course agricultural students, but may be extended and supplemented with laboratory work.

(7.) **Plant Diseases**—A special course with laboratory work will be offered to students who have completed course (2), in which a study will

be made of the more common parasitic plant diseases, their recognition and treatment; with special reference to those of Montana. II, 4.

(7.) **Research Work for Thesis** in some department of botany selected by the student and for which he shall be properly qualified.

The following are some of the subjects already studied:

"Trichomes and Epidermal Organs of Plants" by Edna A. Maynard, 1901. "The Flora of Gallatin County, Montana," by W. W. Jones, 1901. "The Compositæ of Montana" by W. W. Jones, 1902 (M. S.). "The Forage Conditions of Central Montana" by F. A. Spragg, 1902. "The Histological Structure of Certain Montana Woods" by Edna A. Maynard, 1903 (M. S.). "The Alpine Flora of Montana" by P. H. Hawkins, 1903 (M. S.).

Special subjects in other departments of botany will be offered to students properly qualified, who prefer that work. A minimum of four credits will be allowed, but more may be required in special cases, and a part of the work may be done during the summer previous to graduation. For advanced work in any department of botany a reading knowledge of Latin, German and French is almost essential, as a number of the more necessary books of reference are in those languages.

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## **CHEMISTRY.**

PROF. CHESNUT.

MR. BURKE.

MR. REESE.

(1.) **General Chemistry.**—Lectures on the elementary principles of chemistry, with frequent recitations and regular work in the elementary laboratory. A general survey is made of the elements of inorganic chemistry, and, toward the last of the second semester, a few lectures in organic chemistry are given. Each element, and each of its important compounds, is studied with reference to its occurrence in nature, its mode of preparation, its properties and its general applications in the arts. The object of the laboratory work, which is included as an integral part of this course, is to familiarize the student with chemicals and with the simpler methods of chemical manipulation. I and II, 6.

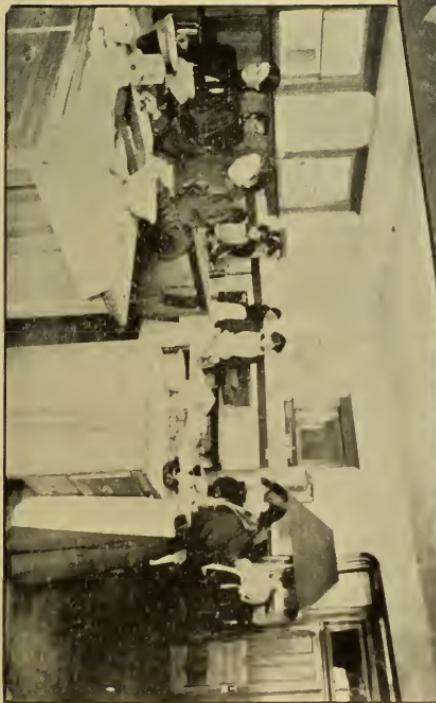
MR. BURKE.

(2.) **Qualitative Analysis.**—A study of the reactions of the various metals and acids and of the methods used for their identification and separation. Simple salts of known composition are first used, and later, after the characteristic reactions are learned, simple salts and complex mixtures, the composition of which is unknown to the student, are given him for study. II, 2.

MR. BURKE.

(3.) **Advanced Inorganic Chemistry.**—In this lecture

DINING ROOM



KITCHEN



SEWING ROOM





ART ROOM





EXPERIMENT STATION LABORATORY



CHEMICAL LABORATORY





ZOOLOGICAL LABORATORY





course the elements and their compounds are studied more in detail than in the first course, and special attention is given to the methods of preparation of the elements and of such of their compounds as are of commercial importance. The theory and practice of the use of acids, alkalies, salts, limes, mortars, cements, explosives, building stones and timber preservatives are also given. I and II, 6.

PROF. CHESNUT.

(4.) **Physical Chemistry.**—A series of lectures and recitations on this important branch of chemistry in which the bearing of modern principles upon operations in the laboratory and on a larger scale in chemical manufacturing is brought out. A general survey of the subject with the special object of showing the practical application of recent chemical theories. I (with 5), 3.

MR. REESE.

(5.) **Laboratory Work in Physical Chemistry.**—Practice in vapor density determinations and in the conductivity, freezing point, boiling point, and other methods, applied to the determination of molecular weights. II, 2.

MR. REESE.

(6.) **Quantitative Analysis, 1.**—The work begins with a study of the balance and of the weights and measures used in analytical work, and for the construction of tables of corrections to be used in future analytical work. Simple salts of known composition are first analyzed, and as the student gains in skill, he passes to substances of increasing complexity and of percentage composition unknown to him. His results must come within a small fraction of one per cent of the instructor's figures on the same sample before they are accepted. II, 5.

MR. BURKE.

(7.) **Quantitative Analysis, 2.**—An extension of the preceding course. I, 5.

MR. BURKE.

(8.) **Inorganic Chemical Preparations.**—The preparation of chemically pure laboratory reagents and other compounds including qualitative and quantitative tests of the purity of the products. One lecture, one recitation, and laboratory work. I, 4. PROF. CHESNUT.

(9.) **Agricultural and Sanitary Chemistry**—Lectures upon the origin, composition and physical properties of soils, the conservation of plant food and moisture, the composition of animal and vegetable tissues, the principles of nutrition, cooking, cleansing and of the disposal of sewage. I and II, 4.

PROF. CHESNUT.

(10.) **Organic Chemistry, 1**—Lectures and recitations on the simpler compounds of carbon. Text book: Remsen's Introduction to the Study of the Compounds of Carbon. I, 3. PROF. CHESNUT.

(11.) **Organic Chemistry, 2**—A laboratory course to accompany course (10) and to familiarize the student with organic com-

pounds and their manipulation. A series of chemically pure organic preparations will be made by each student. II, 3. PROF. CHESNUT.

(12.) **Quantitative Analysis, 3**—The work of a semester is devoted to a study of special methods and to a comparison of different methods with reference to accuracy of results and time required in obtaining them. Volumetric and electrolytic methods will be compared with ordinary gravimetric methods. II, 3. MR. REESE.

(13.) **Quantitative Analysis, 4**—Proximate organic analysis. Methods for analysis of organic compounds, such as grains, grasses, plants, milk, butter, oils, food, paints, asphalt, petroleum and flour. I, 3. PROF. CHESNUT.

(14.) **Toxicology.**—Lectures, recitations and laboratory work on the nature, effect and detection of poisons and their classification. II, 2. PROF. CHESNUT.

(15.) **Chemistry of Foods**—A laboratory and lecture course designed especially for students in the junior year of the Domestic Science course. I and II, 8. PROF. CHESNUT AND MR. BURKE.

(16.) **Assaying.**—An elective course in assaying is offered to seniors taking the chemistry group. Assays are made of lead, tin, gold and silver as found in various ores, and of gold, silver and lead bullion. The cyanide and chlorination processes are carefully studied during the latter part of the semester. One lecture and two laboratory periods, II, 3. MR. BURKE.

(17.) **Seminar, Abstracting.**—In order to develop in the student a habit of careful reading each student will be required to make abstracts of articles on assigned subjects from the leading journals, and present them at weekly meetings of the students and department instructors where the topics are freely discussed. They are thus kept in touch with the progress of the science. I and II, 2. PROF. CHESNUT,

(18.) **Conferences**—Regular meetings for the discussion of the progress of the work of the various students in the laboratory. In this way students and instructors are made acquainted with each other's work, and the student is encouraged to greater effort. PROF. CHESNUT.

(19.) **Thesis.**—In the early part of the senior year the student selects the subject for his graduating thesis. The work done must include a considerable amount of original research. II, 9. PROF. CHESNUT.

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## DOMESTIC SCIENCE.

MISS HARKINS.

MISS BALLINGER.

(1.) **General Cookery**—This course is required of all freshman

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girls. The object of the work is to familiarize the student with the most systematic, economical, healthful and attractive methods of preparing foods. Special attention is given to table decorations and serving of meals. Students who studied cooking in the preparatory course are given work in planning bills of fare and cooking demonstrations. MISS HARKINS.

(2.) **Selection and Preparation of Food and Cooking Demonstrations**—The principles of diet and the relation of food to health are studied. Standard dietaries are examined and bills of fare planned. Each student gives two public demonstrations.

MISS HARKINS

(3.) **Economy of Food**—Special attention is given to the economic side of the food question. Bills of fare are planned and carried out. The government bulletins are read, and the textbook is Ruhard's Cost of Living. MISS HARKINS.

(4.) **Home Architecture and Sanitation**—The surroundings, situation and plan of the house, heating, lighting, plumbing and drainage. MISS HARKINS.

(5.) **Home Nursing and Invalid Cookery.**

MISS HARKINS,

(6.) **Journal Meetings**—Topics relating to domestic science will be assigned and discussed. Articles in magazines will be reviewed. MISS HARKINS.

(7.) **Sewing**—This work is required of all sophomore girls. The work is carefully graded to the capability of the student. At least three plain garments, a shirt waist and an unlined dress must be completed. MISS BALLINGER.

(8.) **Sewing**—Drafting, cutting and fitting and plain dress making. MISS BALLINGER.

(9.) **Sewing**—General dress making. MISS BALLINGER.

(10.) **Sewing**—Art needlework. During the second semester the graduating dress will be made. MISS BALLINGER.

(11.) **Thesis**—In the beginning of the senior year the student selects her subject for graduating thesis. This must be along the line of domestic science or the application of chemistry or biology to domestic science. MISS HARKINS.

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## ENGLISH

PROF. BREWER.

In all the courses in English, written work plays an important part. That this work may be kept up to a proper grade, it is announced here that in college English work no paper will receive any credit that shows

notable carelessness or ignorance in elementary matters of punctuation, grammar, rhetoric, or in the spelling of common words.

(1.) **Composition**—This course is required of all freshmen. The course is almost altogether practice in various types of prose composition—narration, description, exposition, criticism and argumentation. The class meets ordinarily once a week. The instructor from time to time meets each student for private conference about his work. I and II, 4.

(2.) This is a course in expository writing for those students who are specializing in other subjects. Papers not extremely technical, prepared for work in other courses may also be handed in as part of the work of this course. The teaching will be altogether individual. I and II, 4.

(3.) This is an advanced course for those who wish to study composition as a fine art. It will include a study of the historical development of English prose style and such other work as may suit the taste or needs of those who elect the course. I and II, 4.

(10.) **English Literature**—A reading course from Chaucer to the present day. A large amount of reading will be required and more recommended. Written reports are required frequently. A part of the class room time will be given to critical reading of English masterpieces. This course is required of all candidates for the bachelor's degree in science. I and II, 4.

(11.) This course in English literature is varied each year, so that it may be elected two years in succession. The course will be a detailed study of some limited period of English literature or of the history of some special form. The year 1903-4 was given to the study of Tennyson and Browning. I and II, 4.

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## GEOLOGY

PROF. CHESNUT

(1.) **Geology**—Lectures in connection with the use of LeConte's Elements of Geology as a text occupy one semester. The work is divided into dynamical, structural and historical geology, and includes practice in the identification of the age of rocks by fossils, stratigraphical work in the field, and identification of the crystalline rocks by microscopical examination. The fact that the Livingston and Three Forks folios issued by the United States Geological Survey cover the region immediately surrounding us shows how favorably we are situated for field work in geology under the best conditions.

We have within a few miles of the College not only stratified rocks covering great ranges of geological time but we have also many of the eruptives which have been carefully studied and described by expert

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geologists. The course in geology is given only in alternate years. It will be given in 1905-1906. I, 5.

(2) **Economic Geology**—Lectures are given on the following general headings: Ore deposits, classification, genesis, occurrence; abrasive materials; natural salts; gems; limes, cement and artificial stone; pigments; water; phosphates; clays used for pottery, porcelain, etc.; sands for glass; soils and miscellaneous topics. II, 3.

(3.) **Mineralogy**—Lectures upon mineralogy are given, and in conferences the attention of the student is directed to the characteristics of each of the minerals whose identification is required, its resemblance to other minerals and its differences. The lectures deal with all those properties which can be distinguished without apparatus, the chemical composition and tests being only incidentally treated. Later, in determinative mineralogy, unknown minerals are given, and by the application of the chemical tests of blowpipe analysis, and his knowledge of theoretical mineralogy and crystallography, the student identifies the specimens.

The specimens used in this course consist of a large collection illustrating the minerals of economic importance and their associates.

The students also have access to the very extensive collections of the college. II, 2. (First nine weeks.)

(4.) **Crystallography**—Crystallography is taught by the aid of a set of models which illustrate the more important crystalline forms and their modifications. The models cover all the forms of which a knowledge is necessary for the student of mineralogy and the student becomes thoroughly familiar with each of them. II, 1. (First nine weeks.)

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## HISTORY

MISS BREWER.

(1.) **European History**—A general survey of the history of Europe, beginning with Greece and coming down to the present time. The object of this course is to show the part taken by Greece, Rome and the Germanic peoples in the evolution of the social and political institutions of modern Europe. Attention will be paid to the origin and growth of the modern states of Europe. Adams's European History will be used as a text to guide the student's work. I and II, 4.

(2.) **Medieval History**—The student is expected to have had courses which have given him knowledge of the great epochs in history and their relations to each other. Therefore, in this course he will take up the thorough study of one period. He will be encouraged to form his own opinions by the use of such historical sources of this period as are

available in translations. In this connection the student will be given practice in application of the fundamental principles used in testing the value of historical material. I and II, 4.

(5.) **American History**—This is a course in United States history covering the period of constitutional development and with special reference to that development. The use of the library rather than any textbook is required in this course, and the student is expected to spend about one-fourth of the time in the preparation of a paper on some selected subject. Course (2) should precede this course. I and II, 8.

(6.) **Thesis**—For research work in his senior year the student is allowed to select any historical subject which he is qualified to investigate; and for which some material is available, either in translation or printed copies.

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## LATIN

PROF. BREWER

MISS BREWER.

(1.) **Cicero**—The four orations against Catiline are read, and two others. Roman politics, as compared with those of our day, always interest students who have an intelligent interest in current events, and there is every opportunity for such comparative study in this work. I and II, 8.

MISS BREWER.

(2.) **Virgil**—The first six books of the Aeneid are read. Metrical reading of the Latin is required constantly. The students are encouraged to make metrical translations and paraphrases. I and II, 8.

PROF. BREWER,

(3.) **Livy and Horace**—The special aim in this year's work, as in the previous course, is to enable the student to acquire facility in reading and to instruct him in the use of Latin texts as a means of acquiring knowledge of the public and private life of the Romans; but grammatical study and literary criticism will not be neglected. I and II, 4.

MISS BREWER.

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## MATHEMATICS.

PROF. TALLMAN.

(1.) **Algebra**—Beginning with a review of radicals and quadratic equations, the course includes progressions, arrangements and groups,

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binomial theorem, theory of limits, undetermined coefficients, logarithms, and an introduction to the theory of equations. I, 4.

(2.) **Plane Trigonometry**, II, 2.

(3.) **Analytic Geometry**—Straight line and conic sections, with an introduction to the geometry of three dimensions. II, 2, and I, 2.

(4.) **Calculus**—Both differential and integral, with applications to as many practical problems as possible. I, 3; II, 5.

(5.) **Method of Least Squares**—I, 2.

(6.) **Theoretical Astronomy**—Integration of equations of motion, computation of orbits and ephemerides. This course should be preceded by course (7) in Physics and must be preceded by course (4) in Mathematics. II, 3.

(10.) **Differential Equations**—Ordinary and partial differential equations with geometrical and mechanical applications. I and II, 6.

(11.) **Partial Differential Equations of Math.**

**Physics**—This course will be based on Weber's "Die Partiellen Differential Gleichungen der Mathematischen Physik" and Byerly's "Spherical Harmonics." A great many applications to concrete problems will be made throughout the course. I and II, 6.

(12.) **Newtonian Potential**—Lectures on the theory of potential with an introduction to spherical harmonics. I and II, 4.

(13.) **Algebra** (advanced)—This course will be an extension of course 1, and will contain discussions of complex numbers, theory of algebraic functions, etc. Care will be taken to show the practical application of each subject as the work advances; that is, such subjects as the connections between complex numbers and alternating currents, etc., will be fully explained. I and II, 6.

(14.) **Analytical Geometry** (advanced)—This course is a continuation of course 3. As the time given in course 3 for geometry of three dimensions is very limited, it will receive considerable attention in this course. I and II, 6.

(15.) **Thesis**—Students in the mathematical group are required to present a thesis on some chosen subject. The subject must be chosen and approved not later than November 15 of the senior year. A great deal of work in this line is desired, as it is believed there is no better way of developing a habit of independent thought.

(16.) **Mathematic-Physical Seminary**—During the year students and members of the faculty especially interested in these

subjects will meet once a week to review articles of interest in the current magazines, to present from time to time results of original research which is being carried on, etc. Students in the mathematical group are required to attend.

Only part of courses 10 to 14 will be given each year, those being chosen for which most students apply. The special object of our work here is to make the courses in applied mathematics complete, and the work in pure mathematics will have as its object the laying of a good foundation for the more advanced work in applied mathematics. Those desiring to do work which is not offered in the above courses may consult the professor in charge of the department.

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### MODERN LANGUAGES.

PROF. CURRIER.

(1). **French**—The study of French is begun in the freshman year, and the first year's work includes thorough study of the elements of grammar, careful reading, with translation of 300 pages of easy French, composition, practice in pronunciation and oral reading. Fair facility in sight reading is expected at the close of the year. I and II, 8.

(2.) **French**—In the sophomore year, in addition to easy tasks and further study of grammar and composition, specimens of the classics, prose and poetry will be read, and also some scientific French, thus cultivating in the student an appreciation of the best foreign literature. The chief aim of the course is acquisition of practical reading knowledge. I and II, 6.

(3.) **French**—An elective course in the French classic drama and nineteenth century fiction is offered to juniors and seniors. I and II, 6.

(1.) **German**—This course is open to college students who have not had high school or preparatory German. The work of the first year includes careful study of the elements of grammar, composition, pronunciation, conversation, of easy texts, and sight reading, I and II, 8.

(2.) **German**—A continuation of above course. The work consists largely of reading of a practical nature, with some introduction to the classics. Further attention will be paid to grammar and composition. If demanded, scientific German will be read. I and II, 8.

(3.) **German**—The freshman work in German is a continuation of the course offered in the preparatory department, and can be taken only by students who have had two years of German previously. The classics will be studied; also, scientific texts if desired, and some attention will be given to composition and conversation. I and II, 8.

(4) **German**—An elective course offered to those who have com-

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pleted course 2 or 3. It consists chiefly of advanced reading of a practical, scientific, or literary character, as the needs of students electing it may dictate. I and I, 4.

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## PEDAGOGY.

MISS CANTWELL.

The work in this subject is elective, four hours per week. The work of this course includes a study of the prominent educators, and discussions of the principles advanced by them as related to the modern methods of education. II, 4.

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## PHYSICS.

PROF. COBLEIGH.

(1a.) **General Descriptive Physics.**—One lecture and laboratory work two afternoons per week in mechanics, sound, heat, light, electricity and magnetism. This course is arranged to suit the needs of students in the course in agriculture and students in the chemical, biological and other general science groups who do not elect courses (1 and 2). Mathematics (2) is pre-requisite. Text books: General Physics, by Hastings & Beach; Laboratory Course, by Sabine; Laboratory Physics, by Miller. I and II, 6.

(1). **General Physics.**—Lectures, recitations and assigned problems three hours per week throughout the year on mechanics, heat, magnetism and electricity. This course is more mathematical and technical in its nature than physics (1a), and is particularly designed to meet the needs of students in engineering and the general science students in the physics and mathematics groups. Mathematics (2) is pre-requisite, and (3 and 4) must be taken during the same year or in a previous year. Text book: Hastings & Beach's General Physics. I and II, 6.

(2) **Physical Measurements.**—A laboratory course designed to supplement physics (1). It is strictly quantitative and is given for the purpose of providing laboratory illustrations of fundamental principles of the science and to train the student in making measurements of precision. The requirements are the same as for course (1). Text books; Mechanics, Molecular Physics and Heat, by Millikan; Laboratory Physics, by Miller. I and II, 4.

(3) **Electricity and Magnetism.**—Lectures, recitations and problems two hours per week on the elementary mathematical theory

of electricity and magnetism, electrical units and laboratory methods. Required of students in electrical and mechanical engineering and in the physics and mathematics groups. Physics (1 and 2) are pre-requisite. Text book: Electricity and Magnetism, by Gerard. I, 2.

(4.) **Electrical Measurements.**—A laboratory course supplementing course (3). It consists of exact measurements of resistance, electromotive force, current, capacity, and self-induction, calibration of commercial measuring instruments, insulation tests, battery testing and magnetic measurements, including determinations of the permeability and hysteresis of samples of iron. Requirements are the same as for course (3.) I, 2.

(5) **Light and Sound.**—A continuation of courses (1 and 2). Two lectures and five hours' laboratory work per week during second semester of the junior year, II, 4.

(6.) **Advanced Physics.**—Conferences, assigned reading and laboratory work on problems arranged according to the needs of individual students. Pre-requisites are physics (1, 2, 3, 4 and 5). Required of seniors in the physics group. I and II, 6.

Men who elect the physics group are expected to take a course in shop work during their junior year. This work is considered a necessary preparation for physics 6, in which course a student will be called upon to design and construct apparatus to suit his needs. For a description of this course, refer to account of shop work in Bulletin 5.

During the senior year a short course in processes useful in the laboratory will be given as a part of physics (6). It will include elementary glass blowing, cutting, grinding and polishing, preparation of fibers for suspensions, silvering glass, purifying mercury, and photography.

(7.) **Astronomy.**—Two lectures per week for one semester on the fundamental principles and methods of the science. I, 2.

(8.) **Thesis.**—Students in the physics group are required in the senior year to prepare a graduating thesis on some subject which will involve considerable laboratory work and as much originality as possible.

(9.) **Seminary.**—Students interested in physics and mathematics will meet once a week with members of the faculty from those departments, to review articles in the current magazines, to report progress in special work which they may be carrying on, etc.

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**POLITICAL SCIENCE.**

PROF. BREWER.

**Constitution of the United States.**—One semester is given to the study of Bryce's American Commonwealth. The aim of the course will be to give a clear idea of the present day working of our government, and the problems that confront it; and to study intelligently contemporary questions of public life. II, 2.

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**PUBLIC SPEAKING.**

MRS. HALL.

Two meetings a week will be devoted to the study of vocal expression. The work will be co-ordinate with that required in English 1; examples of description, narration, exposition and argumentation will be developed in extemporaneous speeches, with special attention to model briefs for debate. A few recitation periods will be devoted to a review of parliamentary law. The second semester will be devoted to voice culture and the study of oratory. I and II, 2.

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**ZOOLOGY.**

PROF. COOLEY.

MR. JONES.

(1a.) **Invertebrate Zoology.**—Devoted to a general study of invertebrate animals, including their morphology, development, life habits, economic or popular interest and classification are brought out and emphasized. The class room work is based on Weysser's "Synoptic Text Book of Zoology." The laboratory exercises include a study of the morphology of types from actual specimens, reference reading and practice work in the classification of animals. Class room exercises by Prof. Cooley. Laboratory work directed by Mr. Jones. I, 5.

(1b.) **Invertebrate Zoology.**—Required of all mathematics and physics groups students. This course is the same as 1a., except that less laboratory work is required. I, 3.

PROF. COOLEY AND MR. JONES.

(2.) **Vertebrate Zoology.**—Elective for all students who have taken 1a., or its equivalent. Required of students in the zoology group. A continuation of (1a.), taking up vertebrate (chordate) forms. II, 4.

PROF. COOLEY.

(3.) **Histology and Physiology.**—Required of all students in the zoology group, elective for all other general science students whether or not they have taken course 1. The student is required to prepare for microscopical study a series of tissues taken from the body of a freshly killed rabbit, and these slides, together with a large series owned by the department, form the basis of an extended study of animal tissues. By a series of lectures, supplemented by reading courses the student is taught advanced animal physiology. I, 4.

(4.) **Economic Entomology.**—Morphology, metamorphoses and classification of insects. A study of the general principles underlying insect depredations and their control. Natural and artificial means of controlling injurious insects. Required of agriculture and zoology group students. II, 4.

PROF COOLEY.

(5.) **Household Economic Entomology.**—Required of college students in domestic science. Elective for ladies in general science courses who have taken (1a). Lectures on insect life injurious to food materials, clothing, carpets, draperies, etc. I, 2. PROF. COOLEY.





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## COLLEGE PUBLICATIONS.

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The college issues the following publications any or all of which will be sent to any address upon application as soon as issued, Address **J. M. Hamilton**, President, Bozeman, Montana.

**General Information.**—Including a full account of the organization of the college, a description of its buildings and equipment, a full statement of fees, and a list of students.

**General Science.**—The work in general science arranged according to the group system leads to the degree of B. S. The student selects one of the groups of studies arranged about each of the following subjects: Botany, Chemistry, Domestic Science, Mathematics, Modern Languages, History, English, Physics and Zoology.

**Agriculture.**—A full outline of the college course in agriculture, leading to the degree of Bachelor of Scientific Agriculture, with an account of the studies pursued.

**Engineering.**—An outline of the courses in mechanical, electrical and civil engineering, leading respectively to the degrees of Bachelor of Mechanical, Electrical and Civil Engineering, with an account of the subjects studied in each course.

**Preparatory Departments.**—Outlines of the college preparatory course, of the high school courses in agriculture and domestic science and of the one year course in domestic science, with a description of the work.

**Business.**—An outline of the work in bookkeeping, business practice, stenography and typewriting with related work in English, penmanship, commercial law and other branches.

**Art.**—An outline of the work in art, providing a course of four years. more or less, with a description of methods and equipment.

**Music.**—A full account of the work offered in the piano department and in the vocal department, with a statement of the fees. The tuition in these departments is charged separately.

**Winter Courses.**—An account of winter courses in agriculture and engineering, which will begin November 14 and end on March 29. These courses have no requirements for entrance, the fees are smaller than for the other courses and the work is intended to be immediately practical. This bulletin will be issued in September, 1905.

